

Artificial Windshielding of Precipitation Gauges in the Arctic

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INTRODUCTION

Precipitation gauges can provide good measurements of the water equivalent of snow precipitation, provided the gauge is protected or shielded from wind effects. Unfortunately, there are no standards for collecting snow precipitation. Gauges located in exposed and windy areas may be totally unshielded, partially shielded by one or more buildings, or equipped with one of several types of artificial shields. The various shielding options in common use, therefore, produce a wide range of gauge catch efficiency. Also, the various studies of artificial shields in the United States and Canada have produced a wide range of results. This must be, in part, due to the wide range of weather conditions under which the various studies have been conducted. A lingering problem is applying the results to the local conditions of Alaska's tundra regions.

METHODS

A study of the windshield alternatives, under the unique conditions of Alaska's Arctic coastal region, was set up at the CMDL facility at Barrow during September 1989. Snowfall catches from four newly installed precipitation storage gauges were compared with that from an existing storage gauge protected by a Wyoming shield [Hanson, 1988]. Two of the new gauges were shielded—one with a Nipher shield [Goodison et al., 1983] and the other with an Alter shield [Alter, 1937]—and two were unshielded. One of the unshielded gauges was serviced on an event basis, the same as the three shielded gauges. The other unshielded gauge was treated as if it were a remote gauge, allowing rime to build up and dissipate naturally to see what effects rime had on the overall catch. The four newly installed gauges are 20.3 cm in diameter \times 100 cm tall, mounted with the orifice 2 m above the

normal ground surface. The existing Wyoming-shielded gauge is 30.5 cm in diameter \times 2-m tall and is equipped with a Leupold-Stevens water-level recorder.

RESULTS

The 1992-1993 winter season total precipitation is available for comparison of the 5 gauges. The results for the period October 2, 1992 through May 6, 1993 are as follows: The Wyoming-shielded gauge caught a total of 105.7 mm of snowfall precipitation during the period. The Nipher-shielded gauge caught 100.8 mm or 95% of the Wyoming-shielded gauge. The Alter-shielded gauge caught 38.1 mm or 36% of the Wyoming-shielded gauge. The unshielded but serviced gauge caught 19.3 mm or 18% of the Wyoming-shielded gauge. The unshielded and non-serviced gauge caught 14.2 mm or 13% of the Wyoming-shielded gauge. The results continue to confirm the Alter-shielded and unshielded gauges catch one-third or less of the catch of the Wyoming-shielded and Nipher-shielded precipitation gauges.

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